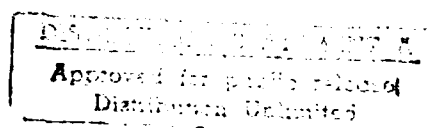②

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Improvements In The Administrative

Efficiency of the Operating Room System

By Using an Automated Scheduling System

At William Beaumont Army Medical Center

A Graduate Research Project

submitted to the Faculty of

Baylor University

In Partial Fulfillment of the

Requirements for the Degree of

Master of Health Administration

by

Major Fernando Martinez, MSC

May 1983

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Tri-Service Medical Information Systems!

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19. ABSTRACT (Continue on reverse if necessary and identify by block number)
In late 1982, it was announced that a (TRIMIS) Hospital Information System (HIS) was to be installed at William Beaumont Army Medical Center, El Paso, Texas, as well as at a USAF Regional Hospital, and a Naval Regional Medical Center. This study focuses on Beaumont where all inpatient and outpatient activities were to be integrated into the system - one which would serve as a communications network, patient data collection system, and an administrative data system. The proposed system, however, did not include scheduling software for the facility's operating room. The author set up an automated operating room scheduling system utilizing a TRS80 microcomputer, and showed that numerous man-hours could be saved in the preparation of daily operating room schedules, the register of operations, and the monthly statistical report. He recommended that the TRIMIS HIS proposal be modified to include the Operating Room Service System. Keywords:)

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Acknowledgements

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I. Introduction

In December 1982 it was announced by Tri-Service Medical Information Systems (TRIMIS) that a Hospital Information System (HIS) would be installed at William Beaumont Army Medical Center (WBAMC), El Paso, Texas; the US Air Force Regional Hospital, Eglin AFB, Florida; and the Naval Regional Medical Center, Jacksonville, Florida. The HIS was to be a turnkey system complete with hardware, software, and personnel training. The target date for implementation was September 1983. Technicon was awarded the contract for all three sites.[1] The Technicon HIS was to be very similar to its sytem which was installed in the El Camino Hospital, Mountain View, California.[2] The entire medical center at William Beaumont will have its inpatient and outpatient activities integrated into the HIS. The HIS will use an IBM 4341 as the mainframe computer and have over 166 remote cathode ray terminals (CRTs) and 86 printers. The system will act as a communications network, patient data collection system, and an administrative data system. The cost of the entire system is $11,400,000.

The proposal on which Technicon based its system did not include scheduling software for the operating room system, and this feature was not currently being used by any of Technicon's HIS customers. However, there is a general outpatient software program which is available and could be modified to meet local requirements.[3] The literature review cited many aspects of operating room utilization and cost finding; however, there were few articles on initiating an automated scheduling system.

Statement of the Research Question.

Given that a hospital information system was going to be installed at William Beaumont Army Medical Center, then, can the operating room service system's administrative efficiency be improved by introduction of an automated scheduling system? The answer to this question will have significant impact on other AMEDD medical treatment facilities as TRIMIS introduces additional HIS systems into Health Services Command.

The specific administrative aspect which was going to be examined for increased efficiency was the scheduling of operative procedures and its related system components which produce the daily operating room schedule and the operating room log. If automation could decrease the amount of time required to perform these functions without a decrease in accuracy, then efficiency would be improved by allowing additional time to be devoted to administrative duties. Subsequently, a proposal could be made to WBAMC Automation Guidance Council that available Technicon software be modified to meet the local requirements and produce required output. No such proposal would be made if there was no decrease in the amount of time used for scheduling by using an automated system. The validation of the increase or decrease in administrative time requirements would be independent of the actual implementation of the HIS. Existing computer capabilities within the hospital would be used by developing a software program which would produce an automated operating room schedule.

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Objectives, Criteria, Assumptions, and Limitations.

The objectives of the research project were:

1. Defining the operating room system as it exists now by using the systems model. Special attention would be focused on the operating room schedule subsystem.

2. The interaction between the principal users (surgical services) and the providers (OR nursing, nursing anesthesia) would be analyzed with respect to the production of the operating room schedule.

3. The temporal aspects of the users and providers in the operating room system, with respect to the production of the operating room schedule, would be analyzed.

4. Descriptive statistics would be developed to quantify key data elements required for scheduling.

5. An implementation plan for integrating the operating room service into the HIS would be developed if improvements in efficiency could be demonstrated.

The criteria for the research project are:

1. To answer the research question affirmatively, the time devoted to administrative duties by the operating room in the preparation of the OR schedule should decrease as a result of automation.

2. The implementation plan must be compatible with the Technicon HIS capabilities with respect to programs, report formats, and data entry.

3. No additional manpower should be required by the implementation plan, beyond temporary assistance to the staff for initial training and periodic reassessment of the plan.

4. The implementation plan should include the production of management reports for scheduling and utilization of the operating rooms.

The assumptions are:

1. The HIS will be installed by September 1983 as stated in the contract.

2. The cost of implementing the plan will require no new additional funding, but instead will be included in the overall implementation costs of the HIS into WBAMC.

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The limitations are:

1. No additional manpower will be required to support the automation plan.

2. The scheduling system will only address the operating rooms in the operating room suite and not other types of surgery conducted on an outpatient/inpatient basis in the clinics and delivery rooms.

3. The implementation will not address the management of recovery rooms, surgical wards, or surgical intensive care beds.

4. As stated previously, the validation of the benefits (if any) of the automated scheduling system will be accomplised on existing computer services and not the HIS.

Research Methodology.

The current operating room service will be analyzed using the systems approach by using flowcharts and narrative descriptions. It will include the interaction of the service users and providers. The following are key data elements:

1. Which surgical procedures, by surgical service, represent 90 percent of the episodes of surgery for each surgical service.

2. Average nursing time for the identified surgical procedures above.

3. Turnaround time for the operating rooms by surgical service.

4. Average time spent by the surgical services and operating room service in preparing the OR schedule and operating room log.

Descriptive statistics will be used to determine the mean times for nursing time by surgical procedure and the mean times spent in preparing schedules and logs. The descriptive statistics will provide baseline data for the implementation of the plan with respect to utilization and scheduling of the operating rooms. The key data elements will be captured using interviews, surveys, and existing reports, specifically:

1. DA Form 140-4, Manpower Survey Report - Schedule X - Manpower and Workload Data.

2. DA Form 4107, Operation Request and Worksheet.

3. DA Form 4108, Register of Operations.

4. DD Form 1923, Operating Room Schedule.

The observed value of the statistic ($\bar{x}$) will be used to draw a conclusion from the population parameter (u) by using interval estimates. The width of the interval will relate to a confidence level of 95 percent.

II. Discussion

Present Operating Room Service System.

The operating room service at WBAMC is located on the fourth floor
of the main hospital and consists of eight operating rooms, four on each
side of a sterile corridor. The administrative offices for the Chief,
Anesthesia and Operative Services; Chief, Operating Room Nursing Service;
and Chief, Anesthesia Nursing Section are all located within the operating
room suite (Figure 1 illustrates the floor plan). Because of the additional
mission of education and training, each chief listed above is responsible
for providing resources to support specific educational requirements.
Table 1 illustrates the additional requirements.

Service/Section	Training Responsibilities
Anesthesia & Operative Service	Anesthesiology for Physicians and Nurse Anesthetists.
Operating Room Nursing Service	OR Professional Nurse Training. OR Training for Enlisted Students. Aseptic Techniques for Enlisted Dental personnel.
Anesthesia Nursing Section	Anesthesia Training to Professional Nurses, Physicians, and Dentists

Table 1. Medical Training Requirements

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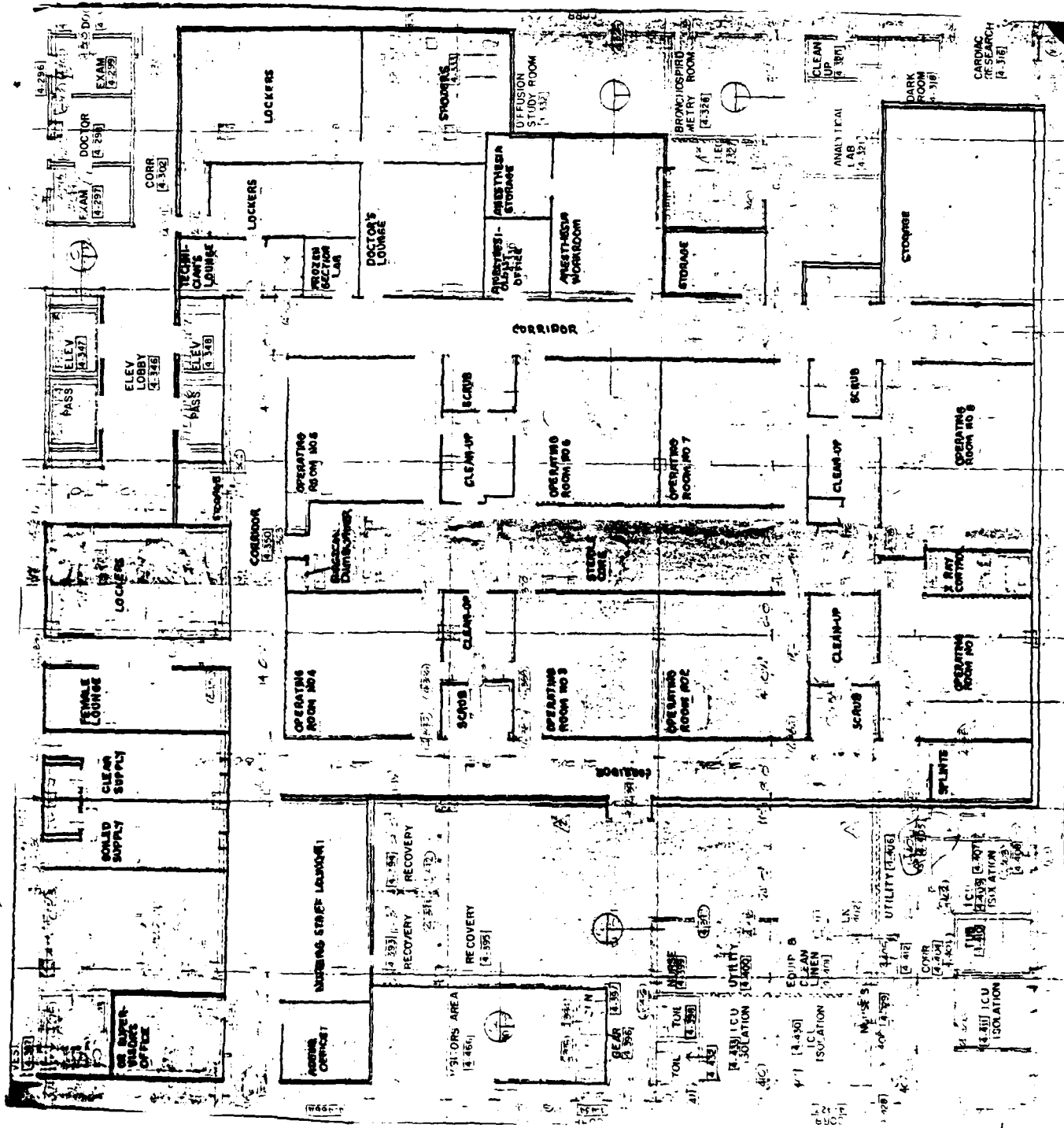
Figure 1 – Operating Room Suite Floor Plan

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The flow of the operating room service system is shown as Figure 2 as a systems model. The Chief, Anesthesiology and Operative Service is the principal control element in this system. This Chief is, in turn, controlled by the Chief, Department of Surgery. Their control is primarily of the professional technical aspects of the system and their influence extends to where the operating room service system interfaces with other systems within the hospital. The Chiefs of OR Nursing Service and Anesthesia Nursing Service have primary control over administrative aspects of the OR service system and are involved in the management of resources, especially personnel staffing. As previously mentioned, there are many students training in the operating room and their educational needs are provided for by all of these service chiefs.

Emergency patients, who arrive through the Emergency Treatment Room, requiring emergency resuscitative surgical care are entered into the Trauma Service. The Chief of Trauma Service coordinates the care of these critical patients until they can be transferred to another service. The Trauma unit is adjacent to the operating room suite and enters into the OR service system as required by circumstances.

As indicated in Figure 2, some operative procedures are performed outside of the operating room suite. These procedures appear on the daily Operating Room Schedule (DD Form 1923) only as a record of personnel assets which were released to cover these procedures. The clinics which perform operative procedures outside the OR are:

(1) Urology

(2) Cardiac Catheterization

(3) Labor and Delivery
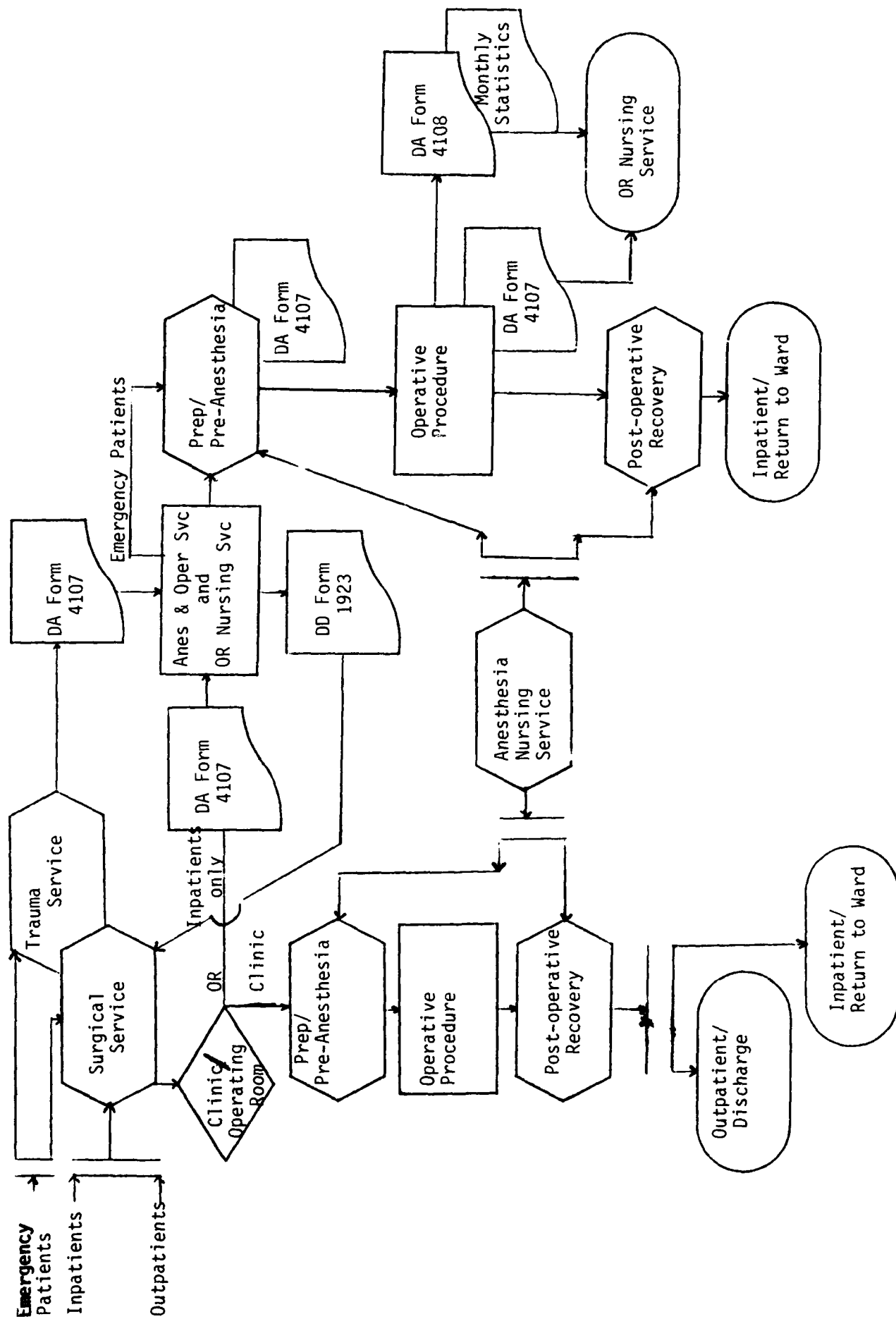
Figure 2. Operating Room Service System

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The surgical services which are users of the OR service system are listed in Table 2.

Surgical Services	
General Surgery	Department of Orthopaedics
Urology	and Rehabilitation
Ophthalmology	Hand Service
Neurosurgery	Department of Obstetrics
Plastic	and Gynecology
Peripheral Vascular	DENTAC
Otolaryngology	Oral Surgery

Table 2. Surgical Services

Manual Scheduling System.

A subsystem of the operating room service is the scheduling of surgical procedures in the eight available operating rooms. Emergency procedures bypass this subsystem and are scheduled into the first available room. If this occurs during normal operating room hours (0700-1500 hours, Monday-Friday), it will result in the postponement of the next scheduled procedure to a later time or date. As shown in Figure 3, the key source document is the DA Form 4107 (Operation Request and Worksheet). A copy of this form is attached as Appendix A. As depicted in Figure 3, it acts as both a source document and worksheet for the anesthetist. Section A is completed by the requesting surgical service which forwards the form to the OR Nursing Service, which reviews the document and makes staff assignments. The form is then reviewed by Anesthesia Nursing Service, which, in turn, makes staff assignments. Then the request is finally approved by Anesthesia and Operative Service. After this approval, the

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Figure 3. Manual Scheduling System
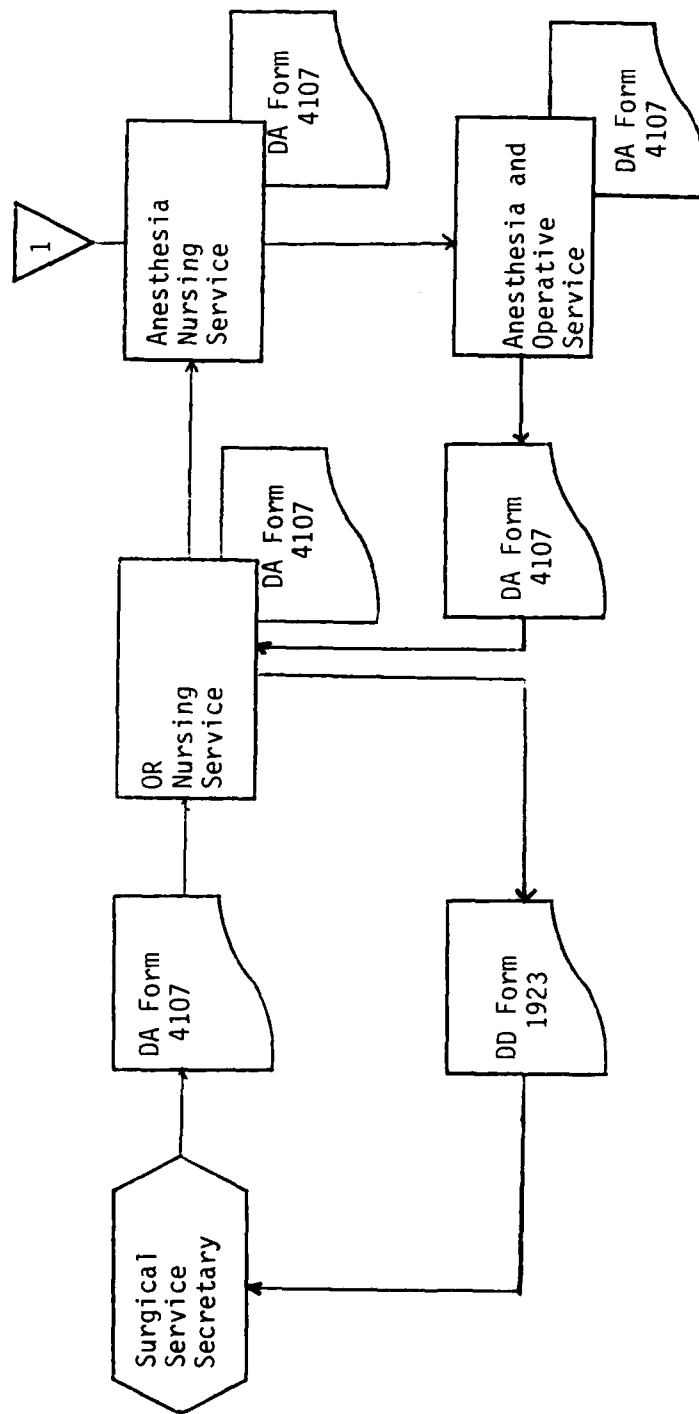
1 ▷ Storage of DA Forms 4107 previously approved awaiting scheduled procedure time.

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procedure is scheduled on DD Form 1923 (Operating Room Schedule) and a
copy of the schedule is returned to the surgical service. Currently,
the schedule is produced only 24 hours in advance. Nonemergency requests
must be received by 0900 hours and the schedule for the next day will be
distributed by 1200 hours. Input received on the last day of the work
week is scheduled for the next occurring work day. Approximately 20
procedures are scheduled daily.

After the request has been reviewed by all necessary parties in the
OR service system, it is kept on file by the Anesthesia Nursing Service
until the procedure is scheduled. The anesthetist completes Section B of
the request which acts as a worksheet for the operative procedure and the
information recorded in Section B serves as a source document for the
completion of the DA Form 4108 (Register of Operations) and an internal
monthly statistical report. These are attached as Appendices B and C.
The DA Forms 4107 arrive at the OR Nursing service either by the surgical
service secretary (handcarries the request) or shipping it in the pneumatic
tube system. The DD Form 1923 is returned either by being picked up by the
secretary or placed in the pneumatic tube system. Changes which occur
are telephoned to the OR Nursing Service which will correct the request
which is filed in Anesthesia Nursing Service. After duty hours and on
weekends/holidays, the Anesthesia Nursing Service will complete both
sections of the DA Form 4107. Currently, each surgical service has
assigned rooms and days of the week to schedule procedures. The current
distribution is attached as Appendix D. The Operating Room Nursing
Service will assign case numbers for each procedure in the appropriately

assigned OR. The amount of time required for each procedure is established by the experience of the surgeon. Occasionally, the surgeon's enthusiasm for completing cases is tempered by the experience of the Chief, OR Nursing Service if it appears that overbooking may cause the operating room to be utilized after 1500 hours for nonemergency cases. The surgeon views the length of a procedure, most often, from incision to closure; the anesthetist's primary view is from intubation to arrousal; but the nursing view is even more lengthy, from preop setup to postop cleanup. Other than intuition and experience, there was no formal system of developing operative procedure times. The operating suite is routinely scheduled for 252 hours a week of surgery divided among the users as shown in Table 3. This does not include any emergency procedures. A scheduled procedure which is deferred by an emergency procedure or by an unexpectedly long procedure scheduled just prior in the same room, becomes a procedure which will compete on a time and space available basis consistent with the patient's condition. Normally, the cases are rescheduled within 24 hours; however, circumstances may cause longer delays. The monthly statistical report, Appendix C, is a numerical compilation which indicates workload but does not provide management analysis or utilization review of the operating room service system.

Total Hours Available Per Week			
General Surgery	35	Plastic Surgery	21
Orthopaedics	35	Thoracic	14
Ortho (Hand)	14	Peripheral Vascular	14
Urology	14	Oral Surgery	14
Ophthalmology	14	OB-GYN	42
Neurosurgery	21	Otolaryngology	14

Total   252

Table 3.   Distribution of OR Time

Data Collection.

The key data elements, which would be necessary to answer the research question, were gathered by researching available documents in the operating room, specifically the DA Form 4107 (Operation Request and Worksheet) and DA Form 4108 (Register of Operations); interviews with the medical, nursing, and administrative staff; written surveys to administrative staff; and literature review. Recalling from the Introduction, there are four critical data elements to develop.

1. The type of surgical procedures which would constitute 90 percent of the episodes of surgery for each of the surgical services listed in Table 2.

2. Average nursing time for the surgical procedures identified above.

3. Turnaround time for the operating rooms by surgical service.

4. Average time spent by the surgical services and operating room service in preparing the OR schedule and OR log.

The identification of the data elements will be discussed in sequence.

Surgical Procedures. The first step was to gather 12 months of operative procedure data based on the monthly internal statistical report. An example of the report is attached as Appendix C. This data would indicate how many surgical procedures were performed by each surgical service, excluding any procedures which were performed outside the operating room suite.

Surgical Procedures By Service November 1981 - October 1982			
General Surgery	828 (18.6)	Plastic	228 (5.1)
Orthopaedics	816 (18.4)	Thoracic	72 (1.6)
Ortho (Hand)	228 (5.1)	Peripheral Vascular	120 (2.7)
Urology	372 (8.4)	Oral Surgery	96 (2.3)
Ophthalmology	156 (3.5)	OB-GYN	1176 (26.5)
Neurosurgery	120 (2.7)	Otolaryngology	228 (5.1)
Total: 4440 procedures			

Table 4. Surgical Procedure Totals

The p ⌐centages are given in parentheses. These percentages compare closely to the distribution of OR time given in Table 3. Given the 12-month totals, a 5 percent non-random pilot sample was taken from each service's procedures to develop a list of procedures as a point of departure in future talks to the surgeons when discussing what procedures constitute 90 percent of their surgical workload. The preliminary lists developed for each surgical service were then discussed with the surgical staff. The final list, which appears at Appendix E, is a reconciliation of the pilot sample and the surgeon's input. This was critical information because any automated scheduling program must have in its memory the bulk of what surgical procedures may be requested and how long these procedures utilize an operating room.

Nursing Time. Nursing time is defined in Army Regulation 40-407, Nursing Records and Reports, as beginning when the nursing staff prepares the OR for the next scheduled case and ends when the staff has the OR ready to receive the next patient at the conclusion of the previous case. Having identified the procedures which constitute 90 percent of the episodes of surgery for each surgical service, the average nursing time for each procedure must be calculated so that the data base will include this information for the automated scheduling program. Nursing time was selected as the parameter because it is the longest of the three times recorded on the DD Form 1923 (Register of Operations) and from a scheduling standpoint, the critical time-line is that amount of time that the operating room will be in use and unavailable for any other procedures. To schedule, one needs to know when

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the room will be available for the next case. Figure 4 illustrates the
relationship between anesthesia time, surgical time, and nursing time. As
determined by experience and observation, however, the nursing time annotated
on the DA Form 4107 (Operation Request and Worksheet) reflects the time the
patient departed the operating room and therefore, an additional element of
turnaround time had to be captured, which would consist of the time required
by the nursing staff and housekeepers to prepare the room for the next case.

To determine the average nursing times for the previously identified
procedures, three peak months of surgical procedures in 1982 (March, April,
and June) were selected as the sample population and the nursing time for
each previously identified procedure was recorded from the DA Form 4108
(Register of Operations). The format of the Register of Operations was
more convenient to record from than the Operation Request and Worksheet,
and the information was identical. For each procedure, an average nursing
time, standard deviation, and sample size were recorded. Using descriptive
statistics, a time interval could be determined in which 95 percent of all
the nursing times for that particular procedure should fall. Appendix E
outlines the statistical analysis. To be conservative and allow the
maximum amount of time for each surgical procedure, the upper limit of the
confidence interval was selected as the average nursing time for the key
data element in the automated schedule program. These times will form the
basis for determining how long an operating room will be utilized for a
particular surgical procedure. In order to establish the total time a room
will be utilized or unavailable for procedures, the turnaround time must be
determined.
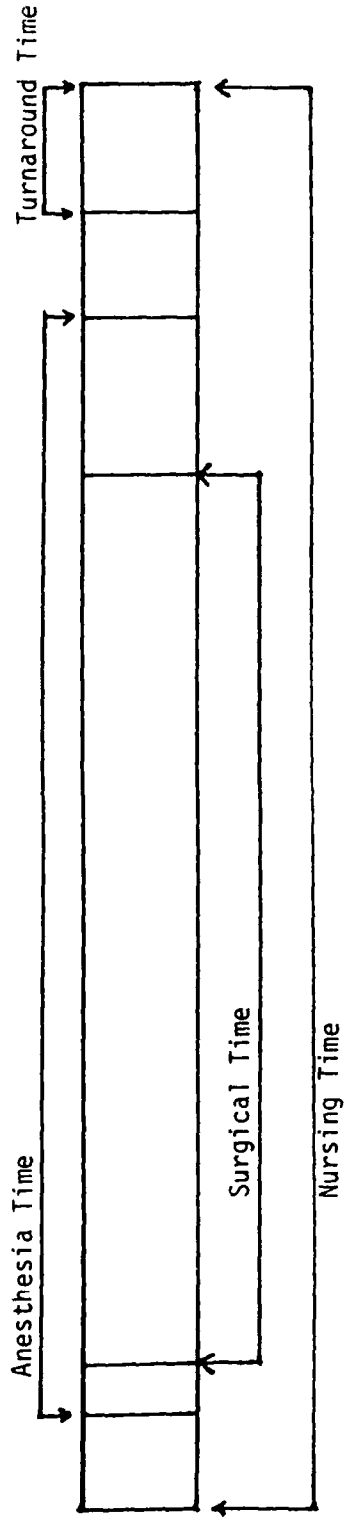
Figure 4. Time Relationships Among Anesthesia Time, Surgical Time, and Nursing Time

Turnaround Time. Turnaround time is the time it takes the nursing staff, anesthesia staff, and housekeeping staff to recover an operating room after a procedure is completed and before another patient can be brought into the same room As mentioned previously, the eight operating rooms are allocated to the surgical services as shown in Appendix D. The OR nurse staffing for these eight rooms remains fairly constant with the same team of scrub teams and circulating nurse staying in the same room, and working with the same services who utilize that room. The team approach lends consistency to the turnaround times. The average turnaround time was determined by surgical service, using three weeks of data collected on a survey worksheet, attached as Appendix F. Each circulating nurse recorded the amount of time it took to clean and prepare an operating room between procedures for the same surgical service. For example, how much time it took to turnaround the operating room between consecutive OB-GYN procedures. The average turnaround times are shown in Table 5. There was no data collected for neurosurgery because there are rarely two consecutive neurosurgical procedures scheduled for the same day.

Surgical Service	Turnaround Time
General Surgery	.20 hours
Urology	.33 hours
Ophthalmology	.45 hours
Thoracic	.22 hours
Plastic	.33 hours
Peripheral Vascular	.22 hours
Otolaryngology	.18 hours
Orthopaedics	.25 hours
Ortho (Hand)	.30 hours
OB-GYN	.29 hours
Oral Surgery	.39 hours

Table 5. Average Turnaround Times by Surgical Service

As an aside to the data collected, the nurses were asked to record the reasons for delays occurring after the operating room nursing staff was ready to receive the next patient. The reasons and the percentage of delays as compared to the total occurrences are listed in Table 6.

Common Delays (29 Recorded/21 Days)			
Surgeon Delayed	31%	Patient Transportation	10%
Anesthesia Delayed	21%	X-Ray Equipment Delayed	4%
Housekeeping	17%	Contaminated Field	3%
Instruments Missing	14%		

Table 6. Delays in Beginning Surgical Procedures

The average turnaround time by surgical service can now be added to the upper limit of the surgical procedure time to determine the average nursing time for each surgical procedure listed. Appendix E summarizes this data.

Administrative Time Used in Schedule Preparation. By using the survey worksheet attached as Appendix G, each surgical service made its input after 10 days of collecting data as to how much time was devoted to preparing Section A of the DA Form 4107 (Operation Request and Worksheet) which was then forwarded to the operating room service. Additionally, the OR Nursing Service, Anesthesia Nursing Service, and Anesthesia and Operative Service were surveyed to determine how much time they devoted in reviewing

Section A and then preparing the DD Form 1923 (Operating Room Schedule) for distribution back to the surgical services. Ten days of data are statistically analyzed at Appendix H and also include the amount of time OR Nursing Service uses in preparing the DA Form 4108 (Register of Operations). Not surprisingly, the surgical services which perform more procedures spend more time requesting operative procedures. The times reported did not include time requesting emergency procedures, which are often done telephonically, with the written request being prepared by OR Nursing Service. The interesting point is that the OR Nursing Service secretary spends an average of 3.5 hours daily collating the data from the DA Form 4107 (Operation Request and Worksheet) and typing the DA Form 4108 (Register of Operations). To provide the most critical test to any time savings made by an automated scheduling system, the lower limit of the confidence interval was selected as the time period for comparison to the time requirements the automated scheduling system would generate.

At this point, all the key data elements and time parameters had been captured and defined. The next point was to design an automated scheduling system to replace the manual system and to determine what time savings were possible, if any.

Design of Automated Scheduling System

Using a TRS 80, Model 12, microcomputer and the Profile Plus Data
Management System programming package, an automated scheduling program
was developed which would capture, not only the key data elements
previously defined, but also every data element which was captured on the
existing forms and reports being utilized in the operating room service
system. The file format programming instructions are given as Appendix
I. These 48 fields would capture the data elements required to produce,
not only a daily operating room schedule, but also the register of
operations and the internal monthly statistical report. Appendix J
displays the four input screens and the two output reports. There were
two important parameters, however, which were unable to be programmed
into the microcomputer owing to limited programming resources. These were
average nursing times for surgical procedures (Appendix E) and the
operating room allocation schedule (Appendix D). These two parameters
were placed on matrix cards for referral by the scheduler in OR Nursing.
The average nursing times were important to predict how long a particular
procedure would utilize an OR room and the allocation schedule was important
in determining which room would be used by a particular surgical service.

This is how the automated system worked. The person responsible for
scheduling procedures in each surgical service would enter the data on
Screen 1, Appendix J. Then OR Nursing service and Anesthesia Nursing Service
would complete Screen 2 using the matrix cards; Anesthesia and Operative
Services would review and approve both screens; and then the program would

print the daily operating room schedule which is given at Appendix K.
After the surgical procedure was performed, Screens 3 and 4 would be called
up and completed by OR Nursing Service and Anesthesia Nursing Service.
When these screens were completed, the output reports listed at Appendix J
could be printed on demand. A copy of all four input screens would be
used as a worksheet for the OR Nursing and Anesthesia Nursing staff to
collect the data manually in the operating room before entering the data
on the microcomputer. By using a microcomputer which was free-standing,
it was not possible to measure the speed of data entry or data distribution
which an integrated network like the HIS would be capable of performing.
This system did, however, eliminate the need to use the DA Form 4107
(Operation Request and Worksheet), DA Form 4108 (Register of Operations),
DD Form 1923 (Operating Room Schedule), and the unnumbered monthly
statistical report. Additionally, the automated scheduling system was
programmed to produce a vital management report, which although not directly
related to the scheduling process, took the data captured on the four
input screens, developed a data base, and then manipulated the data to
produce the operating room utilization report which is attached as
Appendix L. This research provided new information to the Operating Room
managers which although not envisioned at the beginning of the project, has
very positive indications of increasing productivity by realigning OR
allocations.

This report identified the procedures a particular surgical service
performed over a given period of time, who performed the procedures, and
how long the elapsed times were for nursing time, anesthesia time, and

procedure time. Additonally, the total elapsed time was available for
nursing, anesthesia, and procedure by surgical service. This could be an
important record of how much nursing time, anesthesia time, and procedure
time goes into the operating room service system to support 30, 60, etc.
days of surgery. Also, a manual computation can be made by summing the
total nursing time a surgical service accumulates in a 30-day period and
then dividing that sum of hours by the total hours of OR time allocated
to that service in the same time period. This would give each service a
percentage utilization of its allocated OR time. If a standard of 80%
utilization was established as a goal for all surgical services, a
service consistently falling below the goal, could be susceptable to
losing some of its OR time to a service which was exceeding the goal. With
additional programming time and a sufficiently large data base (i.e., 1500
surgical procedures), additional utilization data could be produced for
management decisions.

Comparison of Time Requirements, (Manual Vs Automated).

In Appendix H, the lower limits of the confidence interval for
administrative time spent scheduling and preparing reports for the operating
room service system have been defined. In a test period over three days,
50 operative procedures were requested, scheduled, and reports provided
using the automated scheduling system. In a parallel fashion to the
manual system, this accomplished two objectives: (1) a quick comparison

of time consumed using both the manual and the automated system, and
(2) a back-up system for the automated system in the event there were
errors in the programming. The results were a moderate time savings by
the surgical services in requesting the operative procedures, and an
outstanding time savings by OR Nursing Service in preparing the daily
Operating Room Schedule and Register of Operations. Table 7 summarizes the
data collected over the three-day period, by the services who participated.

Service	Admin. Time Manual	Admin Time Automated	Time Savings (+) or Loss (-)
General Surgery	.33 hours	.28 hours	+ .05 hours
Orthopaedics	.22 hours	.15 hours	+ .07 hours
Ortho (Hand)	.27 hours	.21 hours	+ .06 hours
OB-GYN	.35 hours	.25 hours	+ .10 hours
Thoracic	.05 hours	.05 hours	--
Urology	.26 hours	.19 hours	+ .07 hours
(Review of DA 4107/or Screen 1-2, Automated System)			
OR Nursing	.71 hours	.64 hours	+ .07 hours
Anesthesia Nursing	.49 hours	.43 hours	+ .06 hours
Operative Service and Anesthesia	.64 hours	.56 hours	+ .08 hours
(Preparing DD 1923/or Daily OR Schedule, Automated)			
OR Nursing	1.00 hours	.20 hours	+ .80 hours
(Preparing DA 4108/or Register of Operations, Automated)			
OR Nursing	3.35 hours	.18 hours	+3.17 hours

Table 7. Daily Time Savings or Loss Comparison (Manual Vs Automated)

The data reflects moderate savings of time by the surgical services
in requesting procedures in the range of 15%-32%, and tremendous savings of
time by OR Nursing Service in preparing the Daily OR Schedule (80%) and

the Register of Operations (95%). The time savings, in reviewing Screens 1 and 2, was moderate, and was also due primarily to unfamiliarity in using the automated system; however, the time savings was still in the range of 10%-13%. As previously mentioned, there was a limit in the amount of programming time available, and the average nursing times for the selected surgical procedures (Appendix E) and the operating room allocation by surgical service (Appendix D) had to be inserted on Screen 2 by the scheduler in OR Nursing Service, who had to refer to two matrix data cards. With more programming time available, these parameters could be included and additional time savings could be realized.

The time savings by the surgical services was primarily in the ease of entering data on Screen 1 without having to gather and type the forms. Corrections to the screen were also easier to make. The greatest time savings in the OR Nursing Service was due to not having to collate the data and type the DD Form 1923 (Operating Room Schedule) and the DA Form 4108 (Register of Operations). These output reports were already programmed and were printed on demand, saving up to nearly 20 hours a week in the secretary's efforts.

Therefore, the automated scheduling system, using a TRS 80 microcomputer, did save administrative time to all the system users and it also was able to replace the currently used forms to produce the same reports. With the research question being answered affirmatively, the final step was to prepare a proposal for consideration by the WBAMC Automation Guidance Council.

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Preparation of the Automated Scheduling System Proposal.

The proposal was straightforward because all the data elements used in our automated schedule for the input were defined and accessible. Additionally, the same input provided the same output which was required. However, significant benefits to the automated scheduling system could be received by additional programming modifications which can be made to the existing Technicon Appointment Scheduling Module, which is attached at Appendix M, and integrated into the HIS. These modifications include:

(1) Input of the average nursing time parameters for the surgical procedures listed at Appendix E.

(2) Input of the Operating Room allocations as listed in Appendix D.

(3) Input of the emergency procedures into the first available room and generation of an amended OR schedule for that room.

(4) Decentralized input of the data elements in Screen 1, Appendix J, by the surgical services.

(5) Decentralized output of the Daily OR Schedule to surgical services, nursing stations, and central medical supply (CMS).

(6) Production of the following output concerning utilization review.

(a) Monthly Utilization by Service:

$$\frac{\text{Total Elapsed Nursing Time for all Procedures}}{\text{Total OR Time Available to Service}} \times 100 = \text{Percent Utilization}$$

(b) Average Time for Procedure:

$$\frac{\text{Total Nursing Time for Procedure } (X)}{\text{Total Number of Procedures } (X)} \times 100 = \text{Average Time for Procedure}$$

(c)   Total Surgical Elapsed Time by Service

(d)   Total Procedures by Service

(e)   Total Emergency Procedures by Service

(f)   Total Number of Complications by Service

(g)   Total Procedures by Surgeon by Service

These utilization factors are extremely important to all the service chiefs, both users and providers of the operating room service system, for both internal and external control of resources and time in the operating room. The operating room scheduling subsystem to the HIS is displayed as Figure 5. The subsystem should tie in all users and providers of the operating room service system plus two additional units, CMS and the nursing units. The proposal is attached as Appendix N.
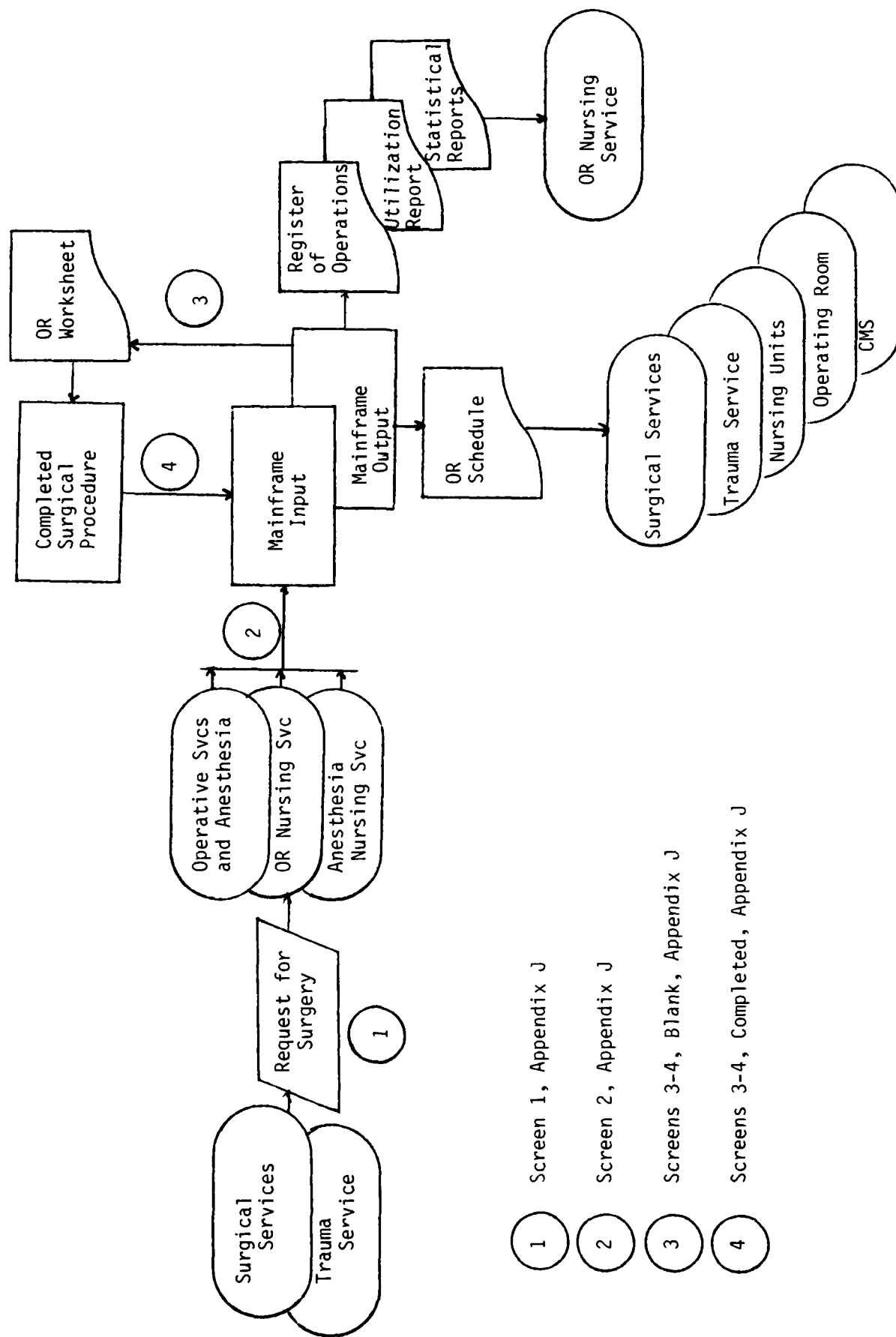
Figure 5. Operating Room Scheduling Subsystem Within the HIS

1 — Screen 1, Appendix J

2 — Screen 2, Appendix J

3 — Screens 3-4, Blank, Appendix J

4 — Screens 3-4, Completed, Appendix J

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III. Conclusions and Recommendations

The automated operating room scheduling system developed on the
TRS 80, Model 12, microcomputer did save administrative time in the
preparation of a daily operating room schedule, register of operations
and monthly statistical report. Over 20 hours a week of secretarial work
was saved by the automated output system which produced the reports. It
should be noted that the OR Nursing Service has been without a secretary
for over 30 days and a combination of nurses and nurse anesthetists have
been collating the data and typing the reports. With additional programming
time, very useful utilization reports can be generated from the automated
scheduling system, because all the critical data elements required for
manipulation have been captured. These utilization reports could be used
to determine allocations of OR time for a surgical service, and how much a
particular service contributes to the total workload.

It is recommended that the proposal for integrating the HIS into the
Operating Room Service System by automated scheduling and production of
reports and utilization data (Appendix N) be favorably considered by the
WBAMC Automation Guidance Council. Additionally, an Operating Room
Utilization Committee should be established to review the statistical
and utilization reports developed by this system.

IV. Footnotes

[1] Award/Contract from Defense Supply Service - Washington, Pentagon, Washington, DC (1 Dec 82), Contract #MDA 903-83-C-0045.

[2] Fleming, John J., "A Medical Information System - Seven Years Later," Hospital Forum, Vol. 22, No. 6, (Sep-Oct 1979), page 10.

[3] Interview with Robert E. Williams, Senior Hospital Consultant, Technicon Data Systems Corporation, Santa Clara, California, 13 December 1982.

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APPENDICES A-N

APPENDIX A

DA FORM 4107 (OPERATION REQUEST AND WORKSHEET)

APPENDIX A

OPERATION REQUEST AND WORKSHEET

For use of this form, see AR 40-407; the proponent agency is the Office of The Surgeon General

SECTION A - REQUEST FOR SURGERY

1. PATIENT'S NAME (Last, First, MI) (Print)		2. STATUS	3. AGE	4. RELI-GION	5. REGISTER NO	6. SSN (with Family Member Prefix)

7. PREOPERATIVE DIAGNOSIS	8. NURSING UNIT (from - to)

9. OPERATION PROPOSED

10. REQUESTING SERVICE	11. DATE OF SURGERY	12. TIME OR CASE NO	13. (Check one) ☐ EMERGENCY ☐ ELECTIVE	14. BLOOD RE-QUIRED (Unit) cc	15. SEPTIC

16. SURGEON	17. ASSISTANT(S)	18. POSITION OF PNT	19. PREP REQUIRED

20. NURSING STAFF	21. ANESTHETIST(S)	22. ANESTHESIA

23. SPECIAL INSTRUCTIONS AND REMARKS

24. REQUESTING OFFICER (Printed Name and Signature)

SECTION B - OPERATION WORKSHEET

25. OPERATING ROOM NO	26. TIME OR CASE NO	27 (Check one) ☐ EMERGENCY ☐ ELECTIVE	28. SEPTIC	29. FLUIDS (other than blood)	30. BLOOD ADMIN-ISTERED

31. SURGEON	32. ASSISTANT(S)	33. ANESTHETIST(S)	34. ANESTHESIA TIME (Began and Ended)

35. INDUCTION ANESTHETIC	AGENT	TECHNIQUE	38. AIRWAY	40. SPECIAL PROCEDURES (Anesthesia)
36. PRIMARY ANESTHETIC	AGENT	TECHNIQUE	39. RELAXANTS INTUBATION | OTHER	
37. SECONDARY ANESTHETIC	AGENT	TECHNIQUE		

41. NURSING TIME (Began and Ended)	42. SCRUB NURSE(S)	43. CIRCULATING NURSE(S)

44. OPERATION DATE	45. OPERATION TIME (Began and Ended)	46. DRAINS	47. SPONGE COUNT	48. LABORATORY SPECIMEN

49. OPERATIVE DIAGNOSIS

50. OPERATION(S) PERFORMED

☐ EPISODES OF SURGERY

☐ MAJOR   ☐ MINOR

51. COMPLICATIONS (Continue on reverse, if more space is required)

52. DICTATOR'S NAME, SERVICE & PHONE EXT	RECORDED IN REGISTER (Initials)

DA FORM 1 JUN 73 **4107**

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APPENDIX B

DA FORM 4108 (REGISTER OF OPERATIONS)

APPENDIX B

REGISTER OF OPERATIONS

* For use of this form, see AR 40-407, the proponent agency is Office of The Surgeon

HOSPITAL

PAGE NUMBER

A repeated form block (6 times) with the following fields:

SEQ NO	DATE	NAME (Last, First, MI)	REGISTER NO	NURSING UNIT	REQUESTING SERVICE	OPERATION PERFORMED ☐MAJOR ☐MINOR	TIME (Anes began) (Surgery began) (Anes & Surgery ended)	SURGEONS	PREOPERATIVE DIAGNOSIS
OR NO	CASE NO	AGE	STATUS		SSN (with Family Member Prefix)				POSTOPERATIVE DIAGNOSIS
EMERGENCY COMBAT	NURSING TIME	NURSING TEAM ☐EPISODE(S)	ANESTHETIST(S)		ANESTHESIA AGENTS	SPONGE COUNT	DRAINS	SPECIMEN TO LABORATORY	COMPLICATIONS ☐SEPTIC

DA FORM 4108   *OR = OPERATING ROOM

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APPENDIX C

MONTHLY STATISTICS

STATISTICS FOR THE MONTH OF _____ APRIL 1983 _____

OR PROCEDURES	535	ASA I	223
GENERAL SURGERY	92	ASA II	173
ORTHOPAEDICS	85	ASA III	54
HAND	30	ASA IV/V	9
PODIATRY		C-SECTIONS	15
UROLOGY	19	NEWBORN TO 24 HOURS	
OPHTHALMOLOGY	24	24 HRS TO 2 YEARS	14
NEUROSURGERY	14	2 YEARS TO 12 YEARS	33
PLASTIC	21	BLOOD	38
THORACIC	10	ELECTIVE	405
P-VASCULAR	14	CANCELLED	47
TRAUMA SERVICE		EMERGENCY/ADD ONS	81
ORAL SURGERY	14	TOTAL PATIENTS	439
GYNECOLOGY	68	GU	20
OBSTETRICS	29	GENERAL ANESTHESIA	361
ENT	19	REGIONAL ANESTHESIA	78
		LOCAL ANESTHESIA	20

TOTAL NUMBER OF PATIENTS 439

TOTAL NUMBER OF ANESTHESIA EPISODES 3 hr 79 4 hr 40

TOTAL NUMBER OF OPERATING ROOM EPISODES 3 hr 96 4 hr 49

OR EPISODES	3 HRS	96
	4 HRS	49
ANES EPISODES	3 HRS	79
	4 HRS	40
DEATHS		1

APPENDIX D

OR ALLOCATION BY SURGICAL SERVICE

OPERATION ROOM SCHEDULE AS OF: March 19__
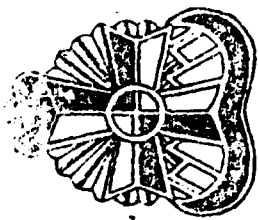
OPERATING ROOM	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
1	GYNECOLOGY		ORAL SURGERY	ORAL SURGERY	ORTHOPAEDIC
2	ORTHOPAEDICS	ORTHOPAEDIC	UROLOGY	ORTHOPAEDIC	ORTHOPAEDIC
3	ORTHOPAEDIC HAND SVC	GENERAL SURGERY	FAMILY PLANNING	ORTHOPAEDIC HAND SVC	GYNECOLOGY/ FAMILY PLANNING
4	GYNECOLOGY	UROLOGY	GYNECOLOGY	GENERAL SURGERY	GYNECOLOGY
5	GENERAL SURGERY	PLASTIC	PLASTIC	PLASTIC	
6		OPHTHAMOLOGY	ENT	OPHTHALMOLOGY	OTOLARYNGOLOGY
7	PERIPHERAL VASCULAR	PERIPHERAL VASCULAR		NEUROSURGERY	GENERAL SURGERY
8	THORACIC	NEUROSURGERY	NEUROSURGERY	GENERAL SURGERY	THORACIC
CLINIC		UROLOGY	UROLOGY		

APPENDIX E

SURGICAL PROCEDURES WITH DESCRIPTIVE STATISTICS FOR AVERAGE NURSING TIMES

APPENDIX E
SURGICAL SERVICE: GENERAL SURGERY (n=200)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

DEFINITIONS: X̄ = AVERAGE
N = SAMPLE SIZE
SD = STANDARD DEVIATION
95% CONFIDENCE INTERVAL (Z) = 1.96

SURGICAL PROCEDURES	N	X̄	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Mastectomy	16	3.16	3.2	3.27	.20	3.9
Excision Ancillary Mass	12	2.27	.07	2.29	.20	2.49
Tracheostomy	4	2.67	.21	2.78	.20	2.98
Exploratory Laporatomy						
a. Lysis of adhesions	4	2.04	.05	2.05	.20	2.25
b. Ileum	4	2.0	.15	2.15	.20	2.35
c. with duodectomy	12	4.68	1.8	5.24	.20	5.44
Herniorrpahy						
a. Ventral	12	2.33	.03	2.34	.20	2.54
b. Inguinal	19	2.37	.48	2.48	.20	2.68
c. Bilateral	4	3.42	.62	4.03	.20	4.23
Appendectomy	19	1.85	.38	2.02	.20	2.22
Cholecystectomy	19	2.16	.58	2.42	.20	2.62
Hemorrhoidectomy	12	2.19	1.0	2.76	.20	2.96
Colostomy/Colon Resection	12	5.73	1.38	6.51	.20	6.71

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SURGICAL SERVICE: GENERAL SURGERY (n=200)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

DEFINITION— $\overline{X}$ = AVERAGE
N = SAMPLE SIZE
SD = STANDARD DEVIATION
95% CONFIDENCE INTERVAL (Z) = 1.96

SURGICAL PROCEDURES	N	$\overline{X}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Peritoneal Dialysis Catheter	4	2.16	.23	2.39	.20	2.59
Epigastric Hernia	4	2.08	.17	2.25	.20	2.45
AP Resection	8	5.58	.24	5.75	.20	5.95
Spincterotomy	4	2.25	.31	2.55	.20	2.75
Thyroidectomy	16	3.03	1.2	3.62	.20	3.82
Colectomy	8	7.29	.18	7.42	.20	7.62
Hemicolectomy	4	1.58	.22	1.80	.20	2.0

SURGICAL SERVICE: ORTHOPAEDICS (n=156)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

SURGICAL PROCEDURES	N	$\bar{x}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Total Hip	22	5.76	.89	5.95	.25	5.25
Arthrotomy/Arthroscopy	30	3.27	.40	3.41	.25	3.66
ORIF						
a. Radius	30	2.95	1.44	3.47	.25	3.72
b. Metatarsal	15	4.17	.85	4.60	.25	4.85
c. Ankle	7	3.67	.72	4.20	.25	4.45
Total Knee	7	3.58	.41	3.88	.25	4.13
Hardware Removal	30	2.54	.47	2.70	.25	2.95
Below the Knee Amputation	15	3.62	.17	3.71	.25	3.96

SURGICAL SERVICE: ORTHOPAEDICS (HAND) N=51

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

DEFINITION: $\overline{x}$ = AVERAGE
N = SAMPLE SIZE
SD = STANDARD DEVIATION
95% CONFIDENCE INTERVAL (Z) = 1.96

SURGICAL PROCEDURES	N	$\overline{x}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Hunter Rod Insertion	5	3.69	1.06	4.62	.30	4.92
Styloidectomy	3	2.58	.87	3.56	.30	3.86
Exploration/Debridement	11	1.38	.18	1.49	.30	1.79
Trigger Finger Release	11	1.81	.18	1.92	.30	2.22
Excision Ganglion	13	1.7	.46	1.95	.30	2.25
Carpal Tunnel Release	8	1.62	.76	2.15	.30	2.45

48

SURGICAL SERVICE: UROLOGY (n=81)

DEFINITIONS: $\overline{X}$ = AVERAGE
N = SAMPLE SIZE
SD = STANDARD DEVIATION
95% CONFIDENCE INTERVAL (Z) = 1.96

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

SURGICAL PROCEDURES	N	$\overline{X}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Nephrectomy	6	5.44	.33	5.70	.33	6.03
Pyeloplasty	4	4.50	.28	4.77	.33	4.13
Uretherolithotomy	25	3.13	1.7	3.80	.33	4.13
Suprapubic Prostatectomy	6	2.98	.39	3.29	.33	3.62
Orchiopexy Inquinal	12	1.96	.37	2.17	.33	3.50
Hydrosadias	4	5.25	.36	5.60	.33	5.93
Hydrocelectomy	4	2.88	.62	3.49	.33	3.82
Vasovasostomy	4	2.33	.31	2.63	.33	2.99
Orchiectomy	6	1.5	.24	1.69	.33	2.02
Scrotal Exploration	4	2.67	.19	2.86	.33	3.29
Cystoscopy	6	1.80	.87	2.67	.33	3.00

SURGICAL SERVICE: OPHTHALMOLOGY (n=25)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

DEFINITIONS: $\overline{X}$ = AVERAGE
N = SAMPLE SIZE
SD = STANDARD DEVIATION
95% CONFIDENCE INTERVAL (Z) = 1.96

SURGICAL PROCEDURES	N	$\overline{X}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Cataracts	10	2.88	.27	2.45	.45	2.90
Strabismus						
a. Exotropia	8	1.8	.42	2.09	.45	2.54
b. Esotropia	7	2.0	.30	2.30	.45	2.75

SURGICAL SERVICE: OB-GYN (N=210)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

DEFINITIONS: $\bar{X}$ = AVERAGE
N = SAMPLE SIZE
SD = STANDARD DEVIATION
95% CONFIDENCE INTERVAL (Z) = 1.96

SURGICAL PROCEDURES	N	$\bar{X}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Total Abdominal Hysterectomy	30	3.1	.81	3.39	.29	3.68
Total Vaginal Hysterectomy	30	1.86	.42	2.01	.29	2.30
Bilateral Salingoophorectomy	30	2.6	.40	2.67	.29	2.96
Exploratory Laparotomy	30	3.28	.70	3.53	.29	3.82
Laproscopic Tubal Ligation	30	1.55	.13	1.60	.29	1.89
Ceserean Section	30	1.58	.42	1.73	.29	2.02
Dilation and Curettage	30	1.10	.10	1.14	.29	1.43

SURGICAL SERVICE: Otolaryngology (n=52)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

DEFINITIONS:
$\overline{X}$ = AVERAGE
N = SAMPLE SIZE
SD = STANDARD DEVIATION
95% CONFIDENCE INTERVAL (Z) = 1.96

SURGICAL PROCEDURES	N	$\overline{X}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Tonsilloadeniodectomy	13	1.22	.16	1.31	.18	1.49
Typanomastoidectomy	8	1.42	.08	1.48	.18	1.66
Direct Laryngoscopy	3	1.45	.02	1.47	.18	1.65
Septoplasty	6	.80	.42	1.14	.18	1.32
Myringotomy with PE Tubes	13	1.12	.17	1.21	.18	1.39

52

SURGICAL SERVICE: Oral Surgery (n=32)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

SURGICAL PROCEDURES	N	$\overline{X}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Temporal Mandibular Joint	4	3.51	.46	3.98	.39	4.37
Vestibuloplasty with Skin Graft	2	2.75	.82	3.33	.39	3.72
Osteotomies						
a. Mandible	4	3.71	1.36	5.04	.39	5.42
b. Maxilla	3	5.44	1.9	6.55	.39	6.94
c. Segmentals	2	3.25	.86	4.44	.39	4.83
d. Genioplasty	3	3.13	.53	3.73	.39	4.12
Extraction of Teeth	4	1.83	.57	2.39	.39	3.78
Ridge Augmentation						
a. Mandibular	3	1.5	.12	1.64	.39	2.03
b. Maxilla	3	2.54	1.47	4.20	.39	4.59

53

SURGICAL SERVICE: Peripheal Vascular (n=26)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

DEFINITIONS: $\overline{X}$ = AVERAGE
N = SAMPLE SIZE
SD = STANDARD DEVIATION
95% CONFIDENCE INTERVAL (Z) = 1.96

SURGICAL PROCEDURES	N	$\overline{X}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Cartoid Endarterectomy	14	3.56	1.04	4.11	.22	4.33
Abdominal Anuerysm	5	3.92	.23	4.12	.22	4.34
Femoro-popliteal By-pass	2	2.40	.17	2.64	.22	2.86
AV-Fistula Shunt	5	3.78	1.03	4.68	.22	4.90

54

SURGICAL SERVICE: Thoracic (n=18)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

SURGICAL PROCEDURES	N	$\overline{X}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Rib Reconstruction	4	2.2	.7	2.89	.22	3.11
Cervical Mediastinal Endoscopy	2	2.33	.19	2.59	.22	2.81
Thoracotomy	4	2.98	.32	3.29	.22	3.51
Permanent Pacemaker	2	2.75	.32	3.19	.22	3.41
Pneumonectomy	2	8.0	1.3	9.80	.22	10.02
Venacava Filter	2	2.75	.35	3.24	.22	3.46
Pericardial Window	2	1.25	.35	1.74	.22	1.96

55

SURGICAL SERVICE: Plastic (n=52)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

SURGICAL PROCEDURES	N	X̄	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Augmentation Mammoplasty	16	2.58	.26	2.70	.33	3.03
Reduction Mammoplasty	8	3.42	.23	3.50	.33	3.83
Abdominoplasty	16	3.04	.44	3.26	.33	3.59
Otoplasty	4	2.42	.31	2.72	.33	3.05
Palataplasty	4	3.42	.35	3.76	.33	3.09
Blepharoplasty	4	2.08	.41	2.48	.33	2.81

SURGICAL SERVICE: Neurosurgery (n-27)

ALL TIMES GIVEN AS DECIMALIZED HOURS (I.E. 30 MINS. = .5 HRS)

SURGICAL PROCEDURES	N	$\overline{X}$	SD	UPPER LIMIT OF PROCEDURE CONFIDENCE INTERVAL	AVERAGE TURNAROUND TIME	AVERAGE NURSING TIME
Laminectomy	12	4.96	1.49	5.80	--	5.80
Exploration of Brain	3	6.58	1.1	7.82	--	7.82
Subdural Hematoma/Temporal Lobectomy	3	5.75	1.5	7.45	--	7.45
Occipitial Craniotomy	6	8.29	1.36	9.38	--	9.38
Lumbar Discectomy	3	3.28	1.2	4.64	--	4.64

APPENDIX F

OPERATING ROOM TURNAROUND TIME WORKSHEET

TURNAROUND TIME WORKSHEET

ROOM # _____   DATE: _____

Case 1   Surgical Service: _____

           Time Patient Departs Room: _____

Case 2   Surgical Service: _____

           Time OR Staff Ready to Receive Patient: _____

           Time Patient Enters Room: _____

           Time Patient Departs Room: _____

           Remarks: _____

           _____

Case 3   Surgical Service: _____

           Time OR Staff Ready to Receive Patient: _____

           Time Patient Enters Room: _____

           Time Patient Departs Room: _____

           Remarks: _____

           _____

Case 4   Surgical Service: _____

           Time OR Staff Ready to Receive Patient: _____

           Time Patient Enters Room: _____

           Time Patient Departs Room: _____

           Remarks: _____

           _____

APPENDIX G

OR SCHEDULING WORKSHEET FOR ADMINISTRATIVE TIME

APPENDIX G

OR SCHEDULING WORKSHEET

FOR ADMINISTRATIVE TIME

1.   The following questions should be answered by the person directly responsible for coordinating the surgical service operating room schedule with the OR staff.

    a. How much time do you spend in completing the request for surgery (DA Form 4107) per day? Per week?

       Day _____/Week _____

    b. When do you usually submit the DA Form 4107 to the OR staff? How is the form delivered?

    c. How do you make changes to the DA Forms 4107 once they are in the hands of the OR staff?

    d. When do you usually receive the OR schedule for the next day?

    e. Do you think it is feasible to forecast the OR schedule past 24 hours to several days or a week? If not, what obstacles do you foresee?

2.   Thank you for your help in this project.

FERNANDO MARTINEZ
Major, MSC
Administrative Resident

APPENDIX H

ADMINISTRATIVE TIME REQUIREMENTS FOR SCHEDULING AND PREPARING REPORTS

Appendix H.   Daily Administrative Time Requirements for Scheduling and
Preparing Reports.   (All times are in decimalized hours.)

Service	n	$\bar{x}$	SD	95% Confidence Interval Lower Limit
General Surgery	10	.34	.02	.33
Urology	10	.30	.07	.26
Ophthalmology	10	.20	.02	.19
Neurosurgery	10	.15	.03	.13
Thoracic	10	.09	.04	.05
Plastic	10	.27	.03	.25
Peripheral Vascular	10	.16	.06	.12
Otolaryngology	10	.28	.01	.27
Orthopaedics	10	.23	.01	.22
Ortho (Hand)	10	.28	.01	.27
OB-GYN	10	.37	.04	.35
Oral Surgery	10	.15	.05	.12
(Review of DA 4107)				
OR Nursing	10	.75	.06	.71
Anesthesia Nursing	10	.52	.05	.49
Operative Service and Anesthesia	10	.68	.07	.64
(Preparing DD 1923)				
OR Nursing	10	1.06	.10	1.00
(Preparing DD 4108)				
OR Nursing	10	3.50	.25	3.25

APPENDIX I

FILE FORMATS PROGRAMMING INSTRUCTIONS

```
              D E F I N E    F I L E    F O R M A T S
+-----------------------------------------------------------------------------

          Field Number          -  Field Heading  -        Field Length

              01              SURGICAL SVC                    00008
              02              ROOM #                          00001
              03              CASE #                          00002
              04              DATE PROC SCHED                 00009
              05              TIME PROC SCHED                 00004
              06              DATE PROC REQ                   00009
              07              WARD                            00004
              08              PAT NAME                        00026
              09              PATIENT ID                      00011
              10              UN 12 AGE                       00001
              11              OVER 12                         00002

-------------------------------------------------------------------------------
Used: 077 of 085 positions.    > Enter Selection

    H  Hardcopy,  R  Replace,  A  Add Fields,  BREAK  Exit or  N  Next Segment
```

D E F I N E   F I L E   F O R M A T S

Field Number	- Field Heading -	Field Length
12	SUR1	00015
13	SUR2	00015
14	SUR3	00015
15	NUR1	00015
16	NUR2	00015
17	NUR3	00015
18	S-N-TI	00004
19	E-N-TI	00004
20	EL-N-TI	00004
21	ANES1	00015
22	ANES2	00015
23	S-AN-TI	00004
24	E-AN-TI	00004
25	EL-ANES-TI	00004
26	S-OP-PRO	00004

Press   H   To Hardcopy   ENTER   To Continue

```
                        D E F I N E   F I L E   F O R M A T S
+ -----------------------------------------------------------------------------

        Field Number             -  Field Heading  -        Field Length

            27              E-OP-PROC                           00004
            28              EL-OP-PRO                           00004
            29              AN-AG                               00030
            30              ANESTHESIA                          00001
            31              ANES LOC                            00001
            32              N-TIME                              00001
            33              SPEC REQ                            00030
            34              OTH FLUIDS                          00015

-------------------------------------------------------------------------------
Used: 234 of 256 positions.    > Enter Selection

    H  Hardcopy,  R  Replace,  A  Add Fields,  BREAK  Exit or  N  Next Segment
```

```
                D E F I N E    F I L E    F O R M A T S
+------------------------------------------------------------------------------

         Field Number            -  Field Heading   -        Field Length
              35           ASA CAT                               00001
              36           DRAINS                                00006
              37           BLOOD                                 00008
              38           PROCEDURE                             00030
              39           EMERGENCY                             00001
              40           PRE OP DIAG                           00020
              41           POST OP DIAG                          00020
              42           CANCELLED                             00001
              43           C-SEC                                 00001
              44           TISSUE REMOVED                        00035
              45           SPONGE & NEEDLE COUNT                 00015
              46           COMPLICATIONS                         00030
              47           DEATH                                 00001
              48           BLOOD USED                            00008


------------------------------------------------------------------------------
Used: 177 of 200 positions.     > Enter Selection

    H  Hardcopy,  R  Replace,  A  Add Fields,  BREAK  Exit or  N  Next Segment
```

68

APPENDIX J

DISPLAY SCREENS FOR INPUT AND OUTPUT

```
=================================================================
+                    OPERATING ROOM SCHEDULE
+                    DATA ENTRY SCREEN 1
+
+ DATE PROCEDURE REQUESTED:  *6
+ PATIENT NAME:  *8
+ PATIENT ID:  *9
+ SURGICAL SERVICE:  *1        EMERGENCY (Y OR N):  *39   WARD:  *7
+ PROCEDURE:  *38
+ PHYSICIAN:  *12               PHYSICIAN:  *13
+ PHYSICIAN:  *14
+       PREOPERATIVE DIAGNOSIS:  *40
+                  AGE (NEW BORN TO 12 YEARS):  #10
+                            ENTER 1 FOR NEWBORN - 24 HRS,
+                            ENTER 2 FOR 24 HRS - 2 YRS,
+                            ENTER 3 FOR 2 YRS - 12 YRS
+  BLOOD:  *37                       AGE OVER 12 YRS ENTER YRS:  #11
+  OTHER FLUIDS:  *34
+  SPECIAL REQUESTS:  *33
=================================================================
```

```
================================================================================
+                       OPERATING ROOM SCHEDULE                                +
+                        DATA ENTRY SCREEN 2                                    +
+ PATIENT NAME:  *8                              PATIENT ID:  *9                +
+                                                                              +
+ DATE SCHEDULED:  *4        ROOM:  #2  CASE:  #3  TIME:  #5                    +
+                                                                              +
+------------------------------------------------------------------------------+
+ NURSING STAFF:  *15              NURSING STAFF:  *16                          +
+ NURSING STAFF:  *17                                                           +
+                                                                              +
+ ANESTHETIST:  *22                ANESTHETIST:  *21                            +
+------------------------------------------------------------------------------+
+    BLOOD:  *48                                                                +
+                                                                              +
+    CANCELLED (Y OR N):  *42                                                   +
+                                                                              +
+    C-SECTION (Y OR N):  *43                                                   +
+                                                                              +
+==============================================================================+
....:....|....:....:....:....:....|....:....^....:....|....:....|....:....|....:
```

```
+=====================================================================
+                        OPERATING ROOM SCHEDULE                      +
+                        DATA ENTRY SCREEN 3                          +
+ PATIENT NAME:  *8                        PATIENT ID:  *9            +
+                                                                     +
+۱POSTOPERATIVE DIAGNOSIS:  *41                                       +
+--------------------------------------------------------------------+
+  START NURSING TIME:  #18     END NURSING TIME:  #19    ELAPSED TIME:  #20   +
+                                                                     +
+  START ANESTHESIA:  #23       END ANESTHESIA:  #24      ELAPSED TIME:  #25   +
+                                                                     +
+ START OPERATING PROCEDURES:  #26  END OPERATING PROCEDURES:  #27    +
+ ELAPSED TIME:  #28                                                  +
+--------------------------------------------------------------------+
+ SPONGE/NEEDLE COUNT VERIFIED BY:  *45                               +
+                                                                     +
- TISSUE REMOVED:  *44                             DRAINS:  *36       +
+                                                                     +
+        COMPLICATIONS:  *46                                          +
+=====================================================================
   ....:....|....:....|....:....|....:....|....^....:....|....:....|....:....|....:....|....:....|
```

```
==================================================================
-                         OPERATING ROOM SCHEDULE                -
+ CASE:                    DATA ENTRY SCREEN 4                    +
+                                                                 +
+ PATIENT NAME:  *8                      PATIENT ID:  *9          +
+ '_____
+ ASA CATEGORY:  #35                                             +
-     (Enter 1 for I,  2 for II,  3 for III,  4 for IV, V)       +
+                                                                 +
+ ANESTHESIA:  #30                                               -
+   (Enter 1 for General,  2 for Regional,  3 for Local)         +
+                                                                 +
+            ANESTHESIA AGENT:  *29                              +
- ANESTHESIA LOCATION:  #31                                      +
+    ( Enter 1 for OR,  2 for L&D,  3 for GU, 4 for other)       +
+                                                                 +
+ NURSING TIME:  #32            DEATH (Y OR N):  #47             +
-     (Enter 1 for less than 3 hours,  2 for 3 hrs but less than 4,  3  4 hrs or+
+         greater).                                              +
==================================================================
.....:.....:.....:.....:.....:.....:.....:......^.....:.....:.....:.....:.....:.....:.....:.....
```

REGISTER OF OPERATIONS

DATE: *4

ROOM: *2

CASE NUMBER: *3

EMERGENCY (YES/NO): *39

PATIENT NAME: *8   PATIENT ID: *9
===
NURSING ELAPSED TIME : *20

NURSINGS STAFF: *15   *16   *17

ANESTHETIST: *21   *22

SURGICAL SERVICE: *1

ANESTHESIA AGENT: *29

PROCEDURE: *38

SPONGE/NEEDLE COUNT VERIFIED BY: *45

DRAINS: *36

PHYSICIANS: *12   *13   *14

TISSUE REMOVED: *44

PREOPERATIVE DIAGNOSIS: *40

POSTOPERATIVE DIAGNOSIS: *41

COMPLICATIONS: *46

OR MONTHLY STATISTICS

TOTAL OR PROCEDURES:

PROCEDURES BY SERVICE:
    GENSURG:
    ORTHO:
    HAND:
    PODIATRY:
    UROLOGY:
    OPTHAL:
    NUERO:
    PLASTIC:
    THORACIC:
    VASCULAR:
    TRAUMA:
    ORAL:
    GYN:
    OB:
    ENT:

PATIENT STATUS.
    ASA I:
    ASA II:
    ASA III:
    ASA IV/V:

C-SECTIONS:

NEWBORN TO 24 HRS:

24 HRS TO 2 YEARS:

2 YEARS TO 12 YEARS:

BLOOD:

SURGERY CANCELLATIONS:

EMERGENCYS:

ANESTHESIA PROCEDURES.
    OR: NURSING TIME.
    L&D: LESS THAN 3 HRS:
    GU: 3 HRS BUT LESS THAN 4 HRS:
OTHER: 4 HRS OR GREATER:
TOTAL:

DEATHS:

ANESTHESIA METHODS.
        GENERAL:
        REGIONAL:
        LOCAL: OUTPUT REPORT 2

APPENDIX K

AUTOMATED DAILY OPERATING ROOM SCHEDULE

DAILY OPERATING ROO

DATE: 5 APR 83

RM TIME	PATIENT NAME	PATIENT ID	WARD	PRC
2 0650	OUCHLEY, STEPHEN	00000000000	8W	REV
3 0655	MCULLLOUGH,WILLIAM	00000000000	6E	(L)
4 0700	SUMMERS, JARED	00000000000	11W	HEF
4 0803	CRUZ,ANNA	00000000000	7E	ECC
4 0910	RAMIREZ, ESTHER	00000000000	7E	POF
4 1115	MULLER, ROGER	00000000000	7E	(R)
2 1200	WILLIS,B BILLY	00000000000	8W	(L)
3 1215	BRUBAKER,RUTH	00000000000	6E	CHC
3 1420	VALDEZ,DAVID	00000000000	6E	UME
4 1800	EALEY, SHIRLEY	00000000000	4P	CEF
4 2145	MONKS, ROBIN	00000000000	4P	C-S

RECORDS SELECTED 00011

ARD	PROCEDURE	PHYSICIAN	ANESTHETIST NURSE
	REVISION,TOT. HIP,ARTHROPLASTY	SMITH	DR STEUNEBSRINK SJMR ZEPEDA
	(L) PAROTIDECTOMY	TODHUNTER	MS SCHAIRER
	HERNIA REPAIR	MALDONADO	MS KAERWER
	ECCE OS	WEEKS	MR ZAVALA
	POP URETHROPEXY	CROSSE	MS KAERWER
	(R) URETERAL LITHOTOMY	CLELAND	MS KAERWER
	(L) ACHILLES TENDON REPAIR	SMITH	MR ZEPEDA
	CHOLECLYSTECTOMY	EASTER	MS SCHAIRER
	UMBILICAL HERNIORRHAPHY	THOMAS	LT PERLATA
	CERVICAL CERCLAGE	THEARD	LT SLOCA
	C-SECTION	DAVIE	LT SLOCA

APPENDIX L

OPERATING ROOM UTILIZATION REPORT

Appendix L

SURGICIAL SERVICE: GEN SURG

PROCEDURE	PHYSICIAN	ELAPSED NURSE TIME
APPENDECTOMY	GAINES	2.67
CHOLECYSTECTOMY	OTERO	2.87
(R)INGUINAL HERNIORRHAPY	THOMAS	1.87
APPENDECTOMY,DIVERT.COLOSTOMY	EASTER	3.86
CHOLECLYSTECTOMY	EASTER	2
UMBILICAL HERNIORRHAPHY	THOMAS	1
EXCISION LIPOMA ON NECK	KULUNGOSWLI	2.01
(L) INGUINAL HERNIORRHAPHY	BURRIS	1.67
(R) INGUINAL HERNIORRHAPY	THOMAS	1.55
APPENDECTOMY	KULUNGJOWSKI	2.67
(L) PAROTIDECTOMY	TODHUNTER	5.33
		27.53

RECORDS SELECTED 00011

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/

OPERATING ROOM REPORT BY SURGICAL SERVICE

DATE: Tue Jun 7 1983

ELAPSED NURSE TIME	ELAPSED ANESTHESIA TIME	ELAPSED PROC TIME	TOTAL ELAPSED TIME
2.67	1.55	1.25	*99
2.87	2.8	2.45	*99
1.87	1.75	1.22	*99
3.86	3.01	2.95	*99
2	1.5	1.24	*99
1	.73	.55	*99
2.01	1.5	1.14	*99
1.67	1.33	.84	*99
1.55	1.48	.73	*99
2.67	2.5	1.44	*99
5.33	4.75	4	*99
27.50	22.90	17.81	

APPENDIX M

TECHNICON APPOINTMENT SCHEDULING MODULE

OPTION ANC-02 AND OUT-01 APPOINTMENT SCHEDULING MODULE (ASM), ANCILLARY AND CLINIC

(Prerequisite: Registration Control System)

The purpose of the Appointment Scheduling Module is to provide a simple, accurate, and efficient method for establishing provider schedules wherein specific patient appointment times can be assigned.

The Appointment Scheduling Module allows the user to do the following:

o   Create unique schedules for a spcific department, group, and resource
o   Define schedule start and end dates/times
o   Define an interval of time for appointment slots
o   Define a number of appointment slots per time interval
o   Delete existing schedules
o   Temporarily block out all or part of an existing schedule
o   View available appointment times
o   Make, cancel, reschedule appointments
o   Make appointments beyond the existing schedule
o   Overbook and doublebook appointments
o   View all appointments made for a patient and/or a resource
o   View/alter and/or delete patient demographic and appointment data
o   Status appointments which were not kept

REPORT GENERATION OVERVIEW

The Appointment Scheduling Module generates numerous reports necessary for the operation, monitoring, and management, of the module. The reports vary in nature from on-line, demand reports; to mailers (patient reminders); to monthly summary reports on patient visit statistics.

OPT 031582   ANC-02-1

The module generates three types of reports:

o   Demand Reports

o   Clinical Worksheet Reports

o   Workload Statistic Reports

Demand Reports optionally print immediately after the initial request by the user. They print on a printer which is assigned to the resource (clinic, department, etc.). The user has flexibility in choosing the data elements and in determining the report format for the data. Demand Reports consist of the following:

o   Appointment Slip

o   Forced Overbook Notification

o   Cancellation Notification

Clinical Worksheet Reports are printed automatically in groups. The user can specify, in a limited fashion, the format of the report (such as the report header), but cannot specify the data elements for the report. These reports may be printed centrally or on departmental printers, as appropriate. They are normally available to the user one or two days prior to the scheduling period covered.

This group consists of the following reports:

o   Appointment Schedule Parameters Report/Edit Error List

o   Pull Chart/Film Reports

o   Chart/Film Outguide Listings

o   Provider Exam Roster

o   Clinic Check-In List

o   Patient Reminder Notice (mailer)

o   Available Appointment Summary Report

o   Transportation List

o   No Show Detail Report

In addition, the Nursing Department Patient Care Plans, if produced, may include appointment information for inpatients.

OP031582   ANC-02-2

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Workload Statistical Reports are also produced in groups. They are printed centrally and then distributed to the user. The user cannot specify the data content or format for these reports. They are available to the user on a monthly basis and contain basic information on clinic visits (no-show, walk-in, kept appointment rates, etc). The reports may be produced in multiple copies. This group consists of the following reports:

o   Monthly Visits Summary Report
o   Year-to-Date Scheduled Appointments Summary Report

APPENDIX N

PROPOSAL FOR AN AUTOMATED OPERATING ROOM SCHEDULE SYSTEM

Appendix N. Proposal for an Automated Operating Room Schedule System

Introduction. The proposal to the WBAMC Automation Guidance Council is to adopt this project and to integrate the Hospital Information System into the Operating Room Service System by automating the operating room daily schedule and the related reports generated by the Operating Room Service System. An automated scheduling system, utilizing a TRS 80, Model 12, microcomputer, has already been developed and tested using a test data base and has demonstrated its ability to save over 20 hours/week in time for the OR nursing staff. The time savings was made in the automatic collating of data and printing of reports, specifically the Operation Request and Worksheet, Operating Room Schedule, Register of Operations, and Monthly Statistical Report. Another important benefit of the automated scheduling system is that it can be used to produce utilization reports which have key management decision information.

System Requirements. It is recommended that the automated scheduling system be based on Technicon's Appointment Scheduling Mcdule (ASM), with additional program modification to produce the required reports. The system should allow for decentralized input/output. The input screens are attached as Erclosure 1. The system flow is attached as Enclosure 2. The output systems are attached as Enclosure 3. The modified program must allow the Chiefs of OR Nursing, Anesthesia Nursing, and Operative Services and Anesthesiology to review the input screens from the surgical services (Screen 1) to make staffing assignments and approval (Screen 2) before the output (Daily

Operating Schedule) can be printed back at the surgical services, nursing units, and CMS. A worksheet consisting of the completed Screens 1 and 2, plus uncompleted Screens 3 and 4, will be printed and held by Nursing Anesthesia until the procedure is completed, then the completed data on Screens 3 and 4 will be entered. The program must be able to accept unscheduled emergency procedures. The surgical procedures which are bumped from the schedule by emergencies should enter a queue of procedures which are waiting for time and space available (TSA). A screen displaying the queue must be available to the Chief, OR Nursing so that rescheduling can occur. The program will also have to accumulate the statistics and utilization data attached as Enclosure 4. The memory space requirements should be large enough to store 600 surgical procedures/month before transferring to other storage devices. The implementation program should also include the production of user manuals and training.

Benefits. The automated scheduling system should be able to save the same amount of time as the microcomputer's system, and through its decentralized input/output capabilities, even more time savings are possible. The time savings using the TRS 80, Model 12, are attached as Enclosure 5. The total time savings over a six-month period should more than pay for the expense of writing the program, (i.e., 80 hours/month x 6 months @ $5.52/hour = $2650.00 at the GS-4 salary rate). Additional benefits will be realized by the production of utilization reports which could impact on the allocation of OR time to the surgical services.

Conclusions. Implement the proposal within sixty days of the implementation of the HIS.

```
================================================================================
+                          OPERATING ROOM SCHEDULE
+                           DATA ENTRY SCREEN 1
+
+ DATE PROCEDURE REQUESTED:   *6
+ PATIENT NAME:   *8
+ PATIENT ID:   *9
+ SURGICAL SERVICE:   *1          EMERGENCY (Y OR N):   *39    WARD:   *7
+ PROCEDURE:   *38
+ PHYSICIAN:   *12                PHYSICIAN:   *13
+ PHYSICIAN:   *14
+       PREOPERATIVE DIAGNOSIS:   *40
+                   AGE (NEW BORN TO 12 YEARS):   #10
+                               ENTER 1 FOR NEWBORN - 24 HRS,
+                               ENTER 2 FOR 24 HRS - 2 YRS,
+                               ENTER 3 FOR 2 YRS - 12 YRS
+  BLOOD:   *37                       AGE OVER 12 YRS ENTER YRS:   #11
+  OTHER FLUIDS:   *34
+  SPECIAL REQUESTS:   *33
================================================================================
....:....!....:....:....!....:....!....:....!....:....^....:....!....:....!....:....!....:.
```

```
================================================================================
+                          OPERATING ROOM SCHEDULE
+                            DATA ENTRY SCREEN 2
+ PATIENT NAME:   *8                                    PATIENT ID:   *9
+
+ DATE SCHEDULED:   *4          ROOM:   #2   CASE:   #3   TIME:   #5
+
+-------------------------------------------------------------------------------
+ NURSING STAFF:   *15                   NURSING STAFF:   *16
+ NURSING STAFF:   *17
+
+ ANESTHETIST:   *22                      ANESTHETIST:   *21
+
+-------------------------------------------------------------------------------
+    BLOOD:   *48
+
+    CANCELLED (Y OR N):   *42
+
+    C-SECTION (Y OR N):   *43
+
+===============================================================================
 ....:....!....:....!....:....!....:....!....:....^....:....!....:....!....:....!....:... 
```

```
=================================================================
+                    OPERATING ROOM SCHEDULE                     +
+                    DATA ENTRY SCREEN 3                          +
+ PATIENT NAME:   *8                        PATIENT ID:   *9      +
+                                                                +
+ POSTOPERATIVE DIAGNOSIS:   *41                                 +
+---------------------------------------------------------------+
+  START NURSING TIME:   #18    END NURSING TIME:   #19   ELAPSED TIME:   #20   +
+                                                                +
+  START ANESTHESIA:   #23      END ANESTHESIA:   #24     ELAPSED TIME:   #25   +
+                                                                +
+ START OPERATING PROCEDURES:   #26   END OPERATING PROCEDURES:   #27   +
+ ELAPSED TIME:   #28                                            +
+---------------------------------------------------------------+
+ SPONGE/NEEDLE COUNT VERIFIED BY:   *45                         +
+                                                                +
+ TISSUE REMOVED:   *44                          DRAINS:   *36    +
+                                                                +
+         COMPLICATIONS:   *46                                   +
=================================================================
....:....!....!....:....!....:....!....:....^....:....!....:....!....:....!....:....!....:....!
```

```
===================================================================================
-                              OPERATING ROOM SCHEDULE                             +
+ CASE:                          DATA ENTRY SCREEN 4                                +
+                                                                                   +
+ PATIENT NAME:  *8                             PATIENT ID:  *9                     +
+ ----------------------------------------------------------------------------------
+ ASA CATEGORY:  #35                                                                +
+     (Enter 1 for I,  2 for II,  3 for III,  4 for IV, V)                          +
+                                                                                   +
+'ANESTHESIA:  #30                                                                  -
+   (Enter 1 for General,  2 for Regional,  3 for Local)                            +
+                                                                                   +
+            ANESTHESIA AGENT:  *29                                                 +
+ ANESTHESIA LOCATION:  #31                                                         +
+     ( Enter 1 for OR,  2 for L&D,  3 for GU, 4 for other)                         +
+                                                                                   +
+ NURSING TIME:  #32                 DEATH (Y OR N):  #47                           +
+     (Enter 1 for less than 3 hours,  2 for 3 hrs but less than 4,  3  4 hrs or+
+        greater).                                                                  +
+===================================================================================
....:....|....:....|....:....|....:....^....:....|....:....|....:....|....:....|
```
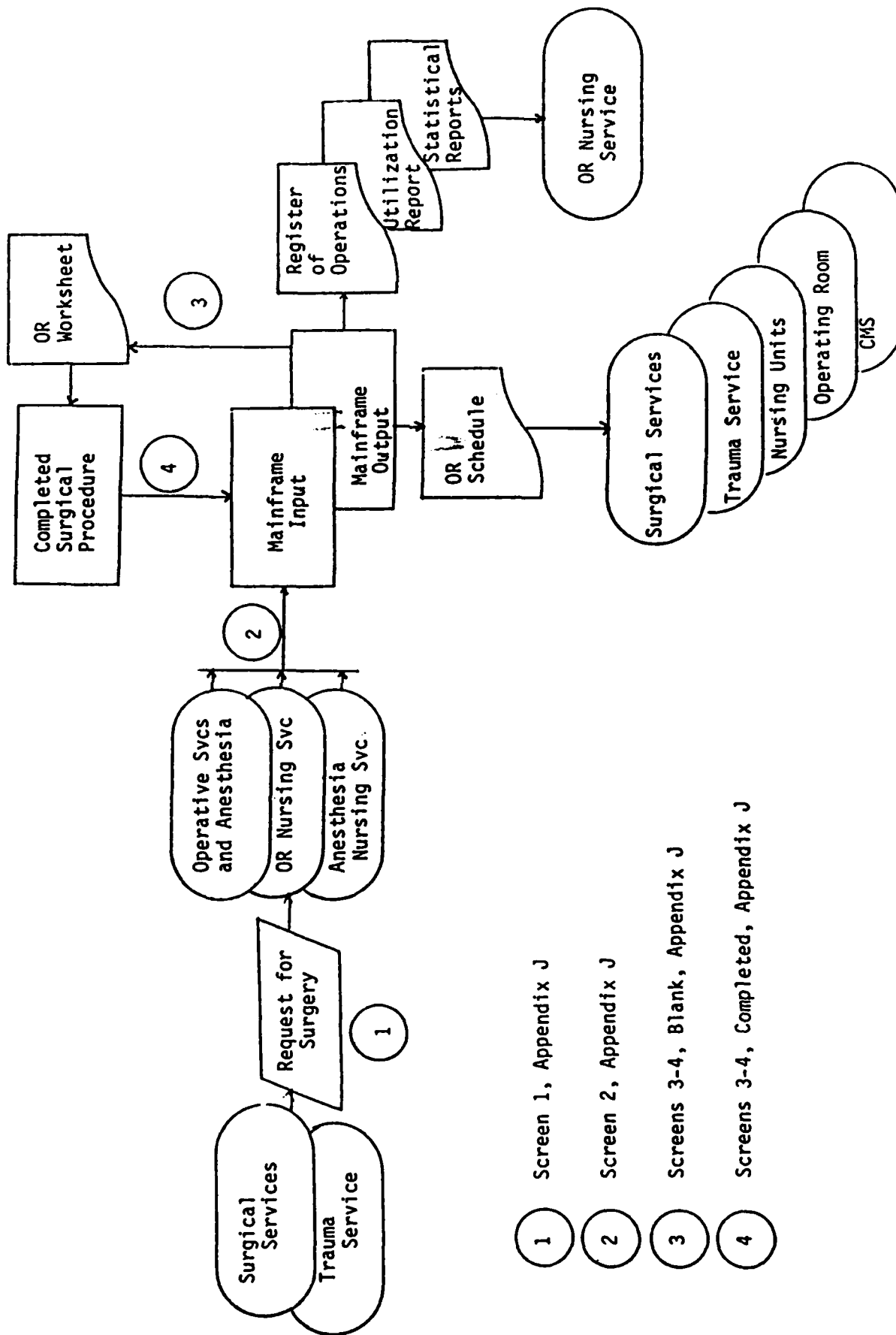
Enclosure 2   Operating Room Scheduling Subsystem Within the HIS

1	Screen 1, Appendix J
2	Screen 2, Appendix J
3	Screens 3-4, Blank, Appendix J
4	Screens 3-4, Completed, Appendix J

DAILY OPERATING ROOM SCHEDULE

DATE: 5 APR 83

RM	TIME	PATIENT NAME	PATIENT ID	WARD	PROCEDURE	PHYSICIAN	ANESTHETIST NURSE
2	0650	OUCHLEY, STEPHEN	00000000000	8W	REVISION,TOT. HIP,ARTHROPLASTY	SMITH	DR STEUNEBSRIN SJMR ZEPEDA
3	0655	MCULLLOUGH,WILLIAM	00000000000	6E	(L) PAROTIDECTOMY	TODHUNTER	MS SCHAIRER
4	0700	SUMMERS, JARED	00000000000	11W	HERNIA REPAIR	MALDONADO	MS KAERWER
4	0803	CRUZ,ANNA	00000000000	7E	ECCE OS	WEEKS	MR ZAVALA
4	0910	RAMIREZ, ESTHER	00000000000	7E	POP URETHROPEXY	CROSSE	MS KAERWER
4	1115	MULLER, ROGER	00000000000	7E	(R) URETERAL LITHOTOMY	CLELAND	MS KAERWER
2	1200	WILLIS,B BILLY	00000000000	8W	(L) ACHILLES TENDON REPAIR	SMITH	MR ZEPEDA
3	1215	BRUBAKER,RUTH	00000000000	6E	CHOLECLYSTECTOMY	EASTER	MS SCHAIRER
3	1420	VALDEZ,DAVID	00000000000	6E	UMBILICAL HERNIORRHAPHY	THOMAS	LT PERLATA
.	1800	EALEY, SHIRLEY	00000000000	4P	CERVICAL CERCLAGE	THEARD	LT SLOCA
.	2145	MONKS, ROBIN	00000000000	4P	C-SECTION	DAVIE	LT SLOCA

RECORDS SELECTED 00011

REGISTER OF OPERATIONS

DATE: *4

ROOM: *2

CASE NUMBER: *3

EMERGENCY (YES/NO):   *39

PATIENT NAME: *8   PATIENT ID: *9
===
NURSING ELAPSED TIME :   *20

NURSINGS STAFF: *15   *16   *17

ANESTHETIST: *21   *22

SURGICAL SERVICE: *1

ANESTHESIA AGENT: *29

PROCEDURE: *38

SPONGE/NEEDLE COUNT VERIFIED BY: *45

DRAINS: *36

PHYSICIANS: *12   *13   *14

TISSUE REMOVED: *44

PREOPERATIVE DIAGNOSIS: *40

POSTOPERATIVE DIAGNOSIS: *41

COMPLICATIONS: *46

TOTAL OR PROCEDURES:

PROCEDURES BY SERVICE:
    GENSURG:
    ORTHO:
    HAND:
    PODIATRY:
    UROLOGY:
    OPTHAL:
    NUERO:
    PLASTIC:
    THORACIC:
    VASCULAR:
    TRAUMA:
    ORAL:
    GYN:
    OB:
    ENT:

PATIENT STATUS.
    ASA I:
    ASA II:
    ASA III:
    ASA IV/V:

C-SECTIONS:

NEWBORN TO 24 HRS:

24 HRS TO 2 YEARS:

2 YEARS TO 12 YEARS:

BLOOD:

SURGERY CANCELLATIONS:

EMERGENCYS:

ANESTHESIA PROCEDURES.
    OR: NURSING TIME.
    L&D: LESS THAN 3 HRS:
    GU: 3 HRS BUT LESS THAN 4 HRS:
OTHER: 4 HRS OR GREATER:
TOTAL:

DEATHS:

ANESTHESIA METHODS.   Encl 3
    GENERAL:
    REGIONAL:
    LOCAL: OUTPUT REPORT 2   94

Required Statistics and Utilization Factors (Monthly)

1. Compute average elapsed nursing anesthesia and procedure times for surgical procedures.

2. Total procedure elapsed time by surgical service.

3. Total procedures by surgical service.

4. Total emergency procedures by service.

5. Total number of complications by service.

6. Total procedures by surgeon, by service.

7. Utilization by service:

   a. $\dfrac{\text{Total Elapsed Nursing Time for all Procedures}}{\text{Total OR Time Available to Service}} \times 100 = \text{Percent Utilization}$

   b. $\dfrac{\text{Total Nursing Time for Procedure (x)}}{\text{Total Number of Procedures (x)}} \times 100 = \text{Average Time for Procedure}$

Service	Admin. Time Manual	Admin Time Automated	Time Savings or Loss
General Surgery	.33 hours	.28 hours	+ .05 hours
Orthopaedics	.22 hours	.15 hours	+ .07 hours
Ortho (Hand)	.27 hours	.21 hours	+ .06 hours
OB-GYN	.35 hours	.25 hours	+ .10 hours
Thoracic	.05 hours	.05 hours	--
Urology	.26 hours	.19 hours	+ .07 hours
(Review of DA 4107/or Screen 1-2, Automated System)			
OR Nursing	.71 hours	.64 hours	+ .07 hours
Anesthesia Nursing	.49 hours	.43 hours	+ .06 hours
Operative Service and Anesthesia	.64 hours	.56 hours	+ .08 hours
(Preparing DD 1923/or Daily OR Schedule, Automated)			
OR Nursing	1.00 hours	.20 hours	+ .80 hours
(Preparing DA 4108/or Register of Operations, Automated)			
OR Nursing	3.35 hours	.18 hours	+3.17 hours

Enclosure 5. Daily Time Savings